#### I affirm: The appropriation of outer space through private entities is unjust

### FW

#### The standard is maximizing expected wellbeing.

#### 1. Death is bad and outweighs – agents can’t act if they fear for their bodily security which constrains every ethical theory

#### 2. Extinction outweighs -

**Pummer 15** [Theron, Junior Research Fellow in Philosophy at St. Anne's College, University of Oxford. “Moral Agreement on Saving the World” Practical Ethics, University of Oxford. May 18, 2015] AT

**There appears to be lot of disagreement in moral philosophy. Whether these many apparent disagreements are deep and irresolvable, I believe there is at least one thing it is reasonable to agree on right now**, whatever general moral view we adopt**: that it is very important to reduce the risk that all intelligent beings on this planet are eliminated by an enormous catastrophe, such as a nuclear war.** How we might in fact try to reduce such existential risks is discussed elsewhere. My claim here is only that **we – whether we’re consequentialists, deontologists, or virtue ethicists – should all agree that we should try to save the world.** According to consequentialism, we should maximize the good, where this is taken to be the goodness, from an impartial perspective, of outcomes. **Clearly one thing that makes an outcome good is that the people in it are doing well. There is little disagreement here.** If the happiness or well-being of possible future people is just as important as that of people who already exist, and if they would have good lives, it is not hard to see how **reducing existential risk is easily the most important thing in the whole world. This is for the familiar reason that there are so many people who could exist in the future – there are trillions upon trillions… upon trillions. There are so many possible future people that reducing existential risk is arguably the most important thing in the world, even if the well-being of these possible people were given only 0.001% as much weight as that of existing people.** Even on a wholly person-affecting view – according to which there’s nothing (apart from effects on existing people) to be said in favor of creating happy people – the case for reducing existential risk is very strong. As noted in this seminal paper, **this case is strengthened by the fact that there’s a good chance that many existing people will, with the aid of life-extension technology, live very long and very high quality lives. You might think what I have just argued applies to consequentialists only. There is a tendency to assume that, if an argument appeals to consequentialist considerations (the goodness of outcomes), it is irrelevant to non-consequentialists. But that is a huge mistake.** **Non-consequentialism is the view that there’s more that determines rightness than the goodness of consequences or outcomes; it is not the view that the latter don’t matter.** Even John Rawls wrote, “**All ethical doctrines worth our attention take consequences into account in judging rightness. One which did not would simply be irrational, crazy.**” **Minimally plausible versions of deontology and virtue ethics must be concerned in part with promoting the good, from an impartial point of view.** **They’d thus imply very strong reasons to reduce existential risk**, at least when this doesn’t significantly involve doing harm to others or damaging one’s character. What’s even more surprising, perhaps, is that even if our own good (or that of those near and dear to us) has much greater weight than goodness from the impartial “point of view of the universe,” indeed even if the latter is entirely morally irrelevant, we may nonetheless have very strong reasons to reduce existential risk. **Even egoism, the view that each agent should maximize her own good, might imply strong reasons to reduce existential risk.** It will depend, among other things, on what one’s own good consists in. If well-being consisted in pleasure only, it is somewhat harder to argue that egoism would imply strong reasons to reduce existential risk – perhaps we could argue that one would maximize her expected hedonic well-being by funding life extension technology or by having herself cryogenically frozen at the time of her bodily death as well as giving money to reduce existential risk (so that there is a world for her to live in!). I am not sure, however, how strong the reasons to do this would be. But views which imply that, if I don’t care about other people, I have no or very little reason to help them are not even minimally plausible views (in addition to hedonistic egoism, I here have in mind views that imply that one has no reason to perform an act unless one actually desires to do that act). **To be minimally plausible, egoism will need to be paired with a more sophisticated account of well-being.** To see this, it is enough to consider, as Plato did, the possibility of a ring of invisibility – **suppose that, while wearing it, Ayn could derive some pleasure by helping the poor, but instead could derive just a bit more by severely harming them. Hedonistic egoism would absurdly imply she should do the latter. To avoid this implication, egoists would need to build something like the meaningfulness of a life into well-being**, in some robust way, where this would to a significant extent be a function of other-regarding concerns (see chapter 12 of this classic intro to ethics). But **once these elements are included, we can (roughly, as above) argue that this sort of egoism will imply strong reasons to reduce existential risk.** Add to all of this Samuel Scheffler’s recent intriguing arguments (quick podcast version available here) that most of what makes our lives go well would be undermined if there were no future generations of intelligent persons. On his view, my life would contain vastly less well-being if (say) a year after my death the world came to an end. So obviously if Scheffler were right I’d have very strong reason to reduce existential risk. **We should also take into account moral uncertainty.** **What is it reasonable for one to do, when one is uncertain not (only) about the empirical facts, but also about the moral facts?** I’ve just argued that **there’s agreement among minimally plausible ethical views that we have strong reason to reduce existential risk – not only consequentialists, but also deontologists, virtue ethicists, and sophisticated egoists should agree.** But **even those (hedonistic egoists) who disagree should have a significant level of confidence that they are mistaken, and that one of the above views is correct. Even if they were 90% sure that their view is the correct one** (and 10% sure that one of these other ones is correct), **they would have pretty strong reason, from the standpoint of moral uncertainty, to reduce existential risk.** Perhaps most disturbingly still, **even if we are only 1% sure that the well-being of possible future people matters, it is at least arguable that, from the standpoint of moral uncertainty, reducing existential risk is the most important thing in the world.** Again, this is largely for the reason that there are so many people who could exist in the future – there are trillions upon trillions… upon trillions. (For more on this and other related issues, see this excellent dissertation). Of course, it is uncertain whether these untold trillions would, in general, have good lives. It’s possible they’ll be miserable. **It is enough for my claim that there is moral agreement in the relevant sense if**, at least given certain empirical claims about what future lives would most likely be like, **all minimally plausible moral views would converge on the conclusion that we should try to save the world.** While there are some non-crazy **views that place significantly greater moral weight on avoiding suffering than on promoting happiness**, for reasons others have offered (and for independent reasons I won’t get into here unless requested to), they nonetheless **seem to be fairly implausible views.** And **even if things did not go well for our ancestors, I am optimistic that they will overall go fantastically well for our descendants, if we allow them to. I suspect that most of us alive today – at least those of us not suffering from extreme illness or poverty – have lives that are well worth living, and that things will continue to improve.** Derek Parfit, whose work has emphasized future generations as well as agreement in ethics, described our situation clearly and accurately: “We live during the hinge of history. **Given the scientific and technological discoveries of the last two centuries, the world has never changed as fast.** We shall soon have even greater powers to transform, not only our surroundings, but ourselves and our successors. **If we act wisely in the next few centuries, humanity will survive its most dangerous and decisive period.** Our descendants could, if necessary, go elsewhere, spreading through this galaxy…. **Our descendants might, I believe, make the further future very good. But that good future may also depend in part on us. If our selfish recklessness ends human history, we would be acting very wrongly.**” (From chapter 36 of On What Matters)

# Ozone

#### Ozone is key to human survival

**European Commission ND**, “Protection of the ozone layer” European Commission Official Website, <https://ec.europa.eu/clima/eu-action/protection-ozone-layer_en> Livingston RB

**World governments agreed** in the late 1980s **to protect th**e Earth’s **ozone** layer by phasing out ozone-depleting substances emitted by human activities, **under the Montreal Protocol**. In Europe, the Protocol is implemented through EU-wide legislation that not only meets its objectives but also contains stricter, more ambitious measures. Global action taken under the Montreal Protocol has halted the depletion of the ozone layer and allowed it to start recovering, but much remains to be done to ensure a steady recovery. **The ozone layer** is a natural layer of gas in the upper atmosphere that **protects humans and other living things from harmful ultraviolet (UV) radiation from the sun**. Although ozone is present in small concentrations throughout the atmosphere, most (around 90%) exists in the stratosphere, a layer 10 to 50 kilometres above the Earth’s surface. **The ozone** layer filters out most of the sun's harmful UV radiation and **is therefore crucial to life on Earth**. Scientists discovered in the 1970s that the ozone layer was being depleted. Atmospheric concentrations of ozone vary naturally depending on temperature, weather, latitude and altitude, while substances ejected by natural events such as volcanic eruptions can also affect ozone levels. However, these natural phenomena could not explain the levels of depletion observed and scientific evidence revealed that certain man-made chemicals were the cause. These ozone-depleting substances were mostly introduced in the 1970s in a wide range of industrial and consumer applications, mainly refrigerators, air conditioners and fire extinguishers.

#### Right now, the ozone layer is recovering which helps climate change

**UN 19**, United Nations Report, 9-16-2019, "Ozone on track to heal completely in our lifetime, UN environment agency declares on World Day.," UN News, <https://news.un.org/en/story/2019/09/1046452> Livingston RB

The phaseout of controlled uses of ozone-depleting substances has not only helped replenish the protective layer for future generations but is also helping guard human health by filtering harmful rays from reaching Earth, said [UNEP](https://www.unep.org/) shared in a[statement](https://ozone.unep.org/ozone-day/32-years-and-healing). The recognition of this success comes on [World Ozone Day,](https://www.un.org/en/events/ozoneday/) marked 16 September. This year celebrates “32 Years and Healing”; a commemoration of the international commitment to protect the ozone later and the climate under the historic [Montreal Protocol](https://ozone.unep.org/sites/default/files/2019-08/MP_Handbook_2019_0.pdf), which has led to the phase-out of 99 per cent of ozone-depleting chemicals in refrigerators, air-conditioners and other consumer products. **Since 2000**, parts of **the ozone** layer **have recovered at a rate of 1-3 per cent** every ten years, the latest [Scientific Assessment of Ozone Depletion](https://www.esrl.noaa.gov/csd/assessments/ozone/2018/)estimates. At projected rates the “**Northern Hemisphere and mid-latitude ozone will heal completely by the 2030’s**”, UNEP said, with the Southern Hemisphere repaired by the 2050’s, and Polar Regions in the following decade. UN Secretary-General, António Guterres [said](https://www.unenvironment.org/news-and-stories/statement/secretary-generals-message-world-ozone-day-2019) “**we must be careful not to neglect the ozone layer**,” as we “rightly focus our energies on tackling climate change”, spotlighting the importance of preventing threats posed by emission of ozone-depleting gases**. Regenerating the ozone has helped curb the effects of climate change** - with approximately 135 billion tonnes of carbon dioxide emissions from 1990 to 2010 averted by a strong protective shield.

#### **But rocket launches destroy the ozone layer regardless of engine type**

University Of Colorado 09 (University Of Colorado, ) Rocket Launches May Need Regulation To Prevent Ozone Depletion, Says Study 4-1-2009 ScienceDaily https://www.sciencedaily.com/releases/2009/03/090331153014.htm //DebateDrills TJ

Future ozone losses from unregulated rocket launches will eventually exceed ozone losses due to chlorofluorocarbons, or CFCs, which stimulated the 1987 Montreal Protocol banning ozone-depleting chemicals, said Martin Ross, chief study author from The Aerospace Corporation in Los Angeles. The study, which includes the University of Colorado at Boulder and Embry-Riddle Aeronautical University, provides a market analysis for estimating future ozone layer depletion based on the expected growth of the space industry and known impacts of rocket launches.

"As the rocket launch market grows, so will ozone-destroying rocket emissions," said Professor Darin Toohey of CU-Boulder's atmospheric and oceanic sciences department. "If left unregulated, rocket launches by the year 2050 could result in more ozone destruction than was ever realized by CFCs."

A paper on the subject by Ross and Manfred Peinemann of The Aerospace Corporation, CU-Boulder's Toohey and Embry-Riddle Aeronautical University's Patrick Ross appeared online in March in the journal Astropolitics.

Since some proposed space efforts would require frequent launches of large rockets over extended periods, the new study was designed to bring attention to the issue in hopes of sparking additional research, said Ross. "In the policy world uncertainty often leads to unnecessary regulation," he said. "We are suggesting this could be avoided with a more robust understanding of how rockets affect the ozone layer."

Current global rocket launches deplete the ozone layer by no more than a few hundredths of 1 percent annually, said Toohey. But as the space industry grows and other ozone-depleting chemicals decline in the Earth's stratosphere, the issue of ozone depletion from rocket launches is expected to move to the forefront.

Today, just a handful of NASA space shuttle launches release more ozone-depleting substances in the stratosphere than the entire annual use of CFC-based medical inhalers used to treat asthma and other diseases in the United States and which are now banned, said Toohey. "The Montreal Protocol has left out the space industry, which could have been included."

Highly reactive trace-gas molecules known as radicals dominate stratospheric ozone destruction, and a single radical in the stratosphere can destroy up to 10,000 ozone molecules before being deactivated and removed from the stratosphere. Microscopic particles, including soot and aluminum oxide particles emitted by rocket engines, provide chemically active surface areas that increase the rate such radicals "leak" from their reservoirs and contribute to ozone destruction, said Toohey.

In addition, every type of rocket engine causes some ozone loss, and rocket combustion products are the only human sources of ozone-destroying compounds injected directly into the middle and upper stratosphere where the ozone layer resides, he said.

Although U.S. science agencies spent millions of dollars to assess the ozone loss potential from a hypothetical fleet of 500 supersonic aircraft -- a fleet that never materialized -- much less research has been done to understand the potential range of effects the existing global fleet of rockets might have on the ozone layer, said Ross.

Since 1987 CFCs have been banned from use in aerosol cans, freezer refrigerants and air conditioners. Many scientists expect the stratospheric ozone layer -- which absorbs more than 90 percent of harmful ultraviolet radiation that can harm humans and ecosystems -- to return to levels that existed prior to the use of ozone-depleting chemicals by the year 2040.

Rockets around the world use a variety of propellants, including solids, liquids and hybrids. Ross said while little is currently known about how they compare to each other with respect to the ozone loss they cause, new studies are needed to provide the parameters required to guide possible regulation of both commercial and government rocket launches in the future.

"Twenty years may seem like a long way off, but space system development often takes a decade or longer and involves large capital investments," said Ross. "We want to reduce the risk that unpredictable and more strict ozone regulations would be a hindrance to space access by measuring and modeling exactly how different rocket types affect the ozone layer."

The research team is optimistic that a solution to the problem exists. "We have the resources, we have the expertise, and we now have the regulatory history to address this issue in a very powerful way," said Toohey. "I am optimistic that we are going to solve this problem, but we are not going to solve it by doing nothing."

#### Unfortunately, private companies are on the way for space industrialization

Victor Tangermann 19 (Victor Tangermann, Toronto-based staff writer for Futurism) Billionaires are dead-serious about moving factories to space 07-03-2019 Futurism https://futurism.com/billionaires-dead-serious-space-factories //DebateDrills TJ

It sounds like science fiction, but the idea of moving heavy industries off Earth seems far less far-fetched ever before.

Collecting resources from other planets or asteroids instead of using up what little we have left on Earth could be the key to ensuring that human beings survive, Discover Magazine reports.

“The solar system can support a billion times greater industry than we have on Earth,” Phil Metzger, a planetary scientist at the University of Central Florida, told Discover. “When you go to vastly larger scales of civilization, beyond the scale that a planet can support, then the types of things that civilization can do are incomprehensible to us.”

As Earth-based resources dwindle, the population increases — and something has to give. At least, that’s the argument behind a new school of companies that have cropped up over the last decade or so, trying to become pioneers of space resource gathering.

For instance, Planetary Resources Inc. has collected tens of millions in funding to develop asteroid mining technologies. But financial troubles meant that the company had to delay its first asteroid prospecting mission indefinitely.

Billionaire Blue Origin and Amazon CEO Jeff Bezos is all-in as well.

“The reason we’ve got to go to space, in my view, is to save the Earth,” Bezos said during the announcement of his space company’s lunar lander last month.

“A very fundamental long-range problem is that we will run out of energy on Earth,” Bezos said at the event. “This is just arithmetic. It will happen.”

Even NASA has recently chosen to invest millions of dollars in tech concepts that could help us explore lunar crates and mining asteroids.

Not only physical resources could become the solution for an overburdened planet. Solar power stations in space could beam near-limitless energy back to Earth — a plan that China is already working to put into action.

#### Private space launches are emitting co2 into the atmosphere and are increasing annually

Gammon 21 Katharine Gammon 7-19-2021 "How the billionaire space race could be one giant leap for pollution" <https://www.theguardian.com/science/2021/jul/19/billionaires-space-tourism-environment-emissions> (Katherine Gammon is an award-winning independent science journalist based in Santa Monica, California. She served in the Peace Corps in Bulgaria and attended MIT and Princeton University.)

Last week Virgin Galactic took Richard Branson past the edge of space, roughly 86 km up – part of a new space race with the Amazon billionaire Jeff Bezos, who aims to make a similar journey on Tuesday. Both very wealthy businessmen hope to vastly expand the number of people in space. “We’re here to make space more accessible to all,” said Branson, shortly after his flight. “Welcome to the dawn of a new space age.” Already, people are buying tickets to space. Companies including SpaceX, Virgin Galactic and Space Adventures want to make space tourism more common. The Japanese billionaire Yusaku Maezawa spent an undisclosed sum of money with SpaceX in 2018 for a possible future private trip around the moon and back. And this June, an anonymous space lover paid $28m to fly on Blue Origin’s New Shepard with Bezos – though later backed out due to a “scheduling conflict”. But this launch of a new **private space industry** that is cultivating tourism and popular use could **come with** vast **environmental costs**, says Eloise Marais, an associate professor of physical geography at University College London. Marais studies the impact of fuels and industries on the atmosphere. When **rockets** launch into space, they **require** a huge amount of **propellants** to make it out of the Earth’s atmosphere. For SpaceX’s Falcon 9 rocket, it is **kerosene, and** for Nasa it is liquid **hydrogen** in their new Space Launch System. Those fuels **emit** a variety of substances into the atmosphere, including **carbon dioxide,** water, chlorine **and other chemicals**. The **carbon emissions from rockets** are small compared with the aircraft industry, she says. But they are i**ncreasing** at nearly **5.6% a year**, and Marais has been running a simulation for a decade, to figure out at what point will they compete with traditional sources we are familiar with. “For one long-haul plane flight it’s one to three tons of carbon dioxide [per passenger],” says Marais. For one rocket launch 200-300 tonnes of carbon dioxide are split between 4 or so passengers, according to Marais. “So it doesn’t need to grow that much more to compete with other sources.” Right now, the number of rocket flights is very small: in the whole of 2020, for instance, there were 114 attempted orbital launches in the world, according to Nasa. That compares with the airline industry’s more than 100,000 flights each day on average. But emissions from **rockets** are **emitted** right **into the upper atmosphere**, which means they **stay** there for a long time: **two to three years**. Even water injected into the upper atmosphere – where it can form clouds – can have warming impacts, says Marais. “Even something as seemingly innocuous as water can have an impact.” Closer to the ground, all fuels emit huge amounts of heat, which can add ozone to the troposphere, where it acts like a greenhouse gas and retains heat. In addition to carbon dioxide, fuels like kerosene and methane also produce soot. And in the upper atmosphere, the ozone layer can be destroyed by the combination of elements from burning fuels. “While there are a number of environmental impacts resulting from the launch of space vehicles, the depletion of stratospheric ozone is the most studied and most immediately concerning,” wrote Jessica Dallas, a senior policy adviser at the New Zealand Space Agency, in an analysis of research on space launch emissions published last year. Another report from 2019 penned by the Center for Space Policy and Strategy likened the space emissions problem to that of space debris, which the authors say **creates an existential risk** to the industry. “Today, launch vehicle emissions present a distinctive echo of the space debris problem. Rocket engine exhaust emitted into the stratosphere during ascent to orbit adversely impacts the global atmosphere,” they wrote. “We just don’t know how large the space tourism industry could become,” says Marais. A new market report estimates that the global suborbital transportation and space tourism market is estimated to reach $2.58bn in 2031, growing 17.15% each year of the next decade. “The major driving factor for the market’s robustness will be focused efforts to enable space transportation, emerging startups in suborbital transportation, and increasing developments in low-cost launching sites,” the report says. In the past, most space transportation has been focused on cargo supply missions to the International Space Station and satellite launch services, but currently, this focus has shifted to in-space transportation, planetary explorations, crewed missions, suborbital transportation and space tourism. Several companies, including SpaceX, Blue Origin and Virgin Galactic, have been focusing on developing platforms such as rocket-powered suborbital vehicles that will enable the industry to carry out suborbital transportation and space tourism. People have pointed out that the money these billionaires have poured into space technology could be invested in making life better on our planet, where wildfires, heatwaves and other climate disasters are becoming more frequent as the globe warms up in the climate crisis. “Is anyone else alarmed that billionaires are having their own private space race while record-breaking heatwaves are sparking a ‘fire-breathing dragon of clouds’ and cooking sea creatures to death in their shells?” the former US Labor Secretary Robert Reich tweeted last week. Marais says that there is always an element of excitement to new developments in space – but it’s still possible to be responsible while doing something exciting. She urges caution as the space tourism industry grows, and says there are currently no international rules around the kinds of fuels used and their impact on the environment. “We have **no regulations c**urrently around rocket emissions,” she says. “The time to act is now – while the billionaires are still buying their tickets.”

#### Innovation from mining won’t solve in time. Prioritize prevention first.

LoïS Miraux 20 (LoïS Miraux, Space Engineering / General Engineering dual-degree graduate, specialised in Environmental Management) The Space Review: Why addressing the environmental crisis should be the space industry’s top priority 10-5-2020 No Publication https://www.thespacereview.com/article/4038/1 //DebateDrills TJ

Space-based environmental monitoring services are making great efforts to curb climate change and provide societies with the means to respond to these global threats and support decision-making. Access to space remains of relevant importance since Earth observation satellites provide critical information on the Earth system: among the 50 Essential Climate Variables identified by climate scientists, 26 can only be measured from space.[1]

These epic endeavors do not help us tackle the challenge of our century, which is facing the environmental crisis and its consequences, and not making the human species multiplanetary.

However, while the current planetary crisis constrains us to sobriety, a number of space projects are looking the other way. Megaconstellations of satellites such as Starlink are being deployed to provide Internet access even in the most remote places on Earth, thriving on the frenetic practice of high frequency trading,[2] while digital technologies now account 4% of greenhouse gas emissions and are expected to reach 8% by 2025 [3]. In an era of “flygskam” or “flight-shame”—the environmental guilt of flying—some private companies are investing in the emerging market of space tourism, like Blue Origin and Virgin Galactic, which is expected in one forecast to grow by 16.6% through 2024.[4] A space hotel in a private space station is even expected around 2024.[5] Space agencies and private companies are also proposing settlements on the Moon and on Mars, to mine resources or even to provide to humanity a “Planet B”. In April 2020, US President Donald Trump signed an executive order reaffirming a decision made by Congress in 2015 stating America has the right to explore and use resources from outer space, putting aside historic treaties that view space as a “global commons” to be governed by international bodies.[6]

Trump’s executive order paves the way to a new headlong technological rush into the solar system. These projects appear as an ultimate, desperate rush to push back the limits of growth, while shortages and geopolitical tensions on Earth enable us to perceive these limits clearer than ever.

It is true that, looking back to the story of science and technology, these projects could look like pioneering endeavors that will ultimately be beneficial for humanity. It is a natural step in the history of a civilization looking to keep growing to go out of its home planet, exploit resources in its surrounding space, and ultimately settle its planetary system. But as humans on Earth are facing serious existential threats, will we make it on time?

We are told that asteroid mining will solve our shortages in minerals and metals, which are so important to make our transition towards low-carbon energies like solar and wind, and to fuel our ever-growing demand in tons of applications, from mobile phones and computers to chemical catalysts. However, roadmaps built up by specialists—which did not predict the failures of the two main asteroid mining companies, Planetary Resources and Deep Space Industries—indicate that first mining missions may happen only by 2040.[7] Space-based solar power stations would overcome the issues of Earth-based solar and wind, whose intermittency and need of storage cannot bring us towards near-zero emissions. But even betting on plummeting launch costs that are still far from reality today, this could hardly become real before another 50 years.[8,9] The settlement of Mars, apart from pure scientific objectives, would even provide us with a “Planet B” in case life on Earth becomes impossible. But terraforming Mars, assuming that it is possible, would take about 100,000 years according to some estimates.[10,11] Yes, in a couple of decades, some lucky few may be able to retire under a dome in a Mars colony while life on Earth becomes more and more difficult, but it is a rather bleak prospect.

These epic endeavors do not help us tackle the challenge of our century, which is facing the environmental crisis and its consequences, and not making the human species multiplanetary. Because there is not much sense in making like multiplanetary if it collapses or even becomes extinct right after. This is not about criticizing these endeavors themselves as if they were inherently bad; it is rather about showing that, in this unique context in the history of humanity, where our home planet is quickly becoming uninhabitable, their inability to help make them secondary at best, if not completely irrelevant. They promise technological solutions not realistic within the time scale of the current crisis, which shows a profound misunderstanding of the crisis itself among some of their advocates. The target of the Paris agreement, which is paramount to meet in order to avoid dangerous nonlinear and irreversible effects,[12] requires a profound transformation of our societies by 2050, beginning now. Such a transformation is likely to trigger social instability and geopolitical tensions reinforced by a fast-changing climate and resource depletion.[13,14] Consequently, the credibility and popularity of these technical solutions in space will probably decrease, making them even more difficult to achieve.

#### Warming is linear—every decrease in rising temperatures radically mitigates the risk of existential climate change. Passing 2°C leads to extinction.

**Worland, 20** (Justin Worland, Justin Worland is a Washington D.C.-based senior correspondent for TIME covering climate change and the intersection of policy, politics and society., 7-9-2020, accessed on 12-17-2021, Time, "2020 Is Our Last, Best Chance to Save the Planet", <https://time.com/5864692/climate-change-defining-moment/>) DD//SV

**We’re standing at a climate crossroads: the world has already warmed 1.1°C since the Industrial Revolution. If we pass 2°C, we risk hitting one or more major tipping points, where the effects of climate change go from advancing gradually to changing dramatically overnight, reshaping the planet**. To ensure that we don’t pass that threshold, we need to cut emissions in half by 2030. Climate change has understandably fallen out of the public eye this year as the coronavirus pandemic rages. Nevertheless, this year, or perhaps this year and next, is likely to be the most pivotal yet in the fight against climate change. “We’ve run out of time to build new things in old ways,” says Rob Jackson, an earth system science professor at Stanford University and the chair of the Global Carbon Project. **What we do now will define the fate of the planet–and human life on it–for decades.** The **time frame for effective climate action was always going to be tight, but the coronavirus pandemic has shrunk it further.** Scientists and policymakers expected the green transition to occur over the next decade, but the pandemic has pushed 10 years of anticipated investment in everything from power plants to roads into a monthslong time frame. Countries have already spent $11 trillion to help stem the economic damage from COVID-19. They could spend trillions more. “It’s in this next six months that recovery strategies are likely to be formulated and the path is set,” says Nicholas Stern, a former World Bank chief economist known for his landmark 2006 report warning that **climate change could devastate the global economy**. We don’t know where the chips will fall: Will a newfound respect for science and a fear of future shocks lead us to finally wake up, or will the desire to return to normal overshadow the threats lurking just around the corner? One of Los Angeles’ most crowded highway interchanges was nearly empty during rush hour on April 24. Stuart Palley We find ourselves on the brink of climate catastrophe in large part because of the decisions made during a past crisis. As the world came out of the Great Depression and World War II, the U.S. launched a rapid bid to remake the global economy–running on fossil fuels. In the first postwar years, Americans moved to suburbs and began driving gas-guzzling cars to work, while the federal government built a highway system to connect the country for those vehicles. The single biggest line item in the Marshall Plan, the U.S. government program that funded the European recovery, went to support oil, which ensured that the continent’s economy would also run on that fossil fuel. Meanwhile, plastic, an oil derivative, became the go-to building block for consumer goods after the U.S. had developed production capacity for use in World War II. The underlying philosophy of economic development in this time period was a focus on gross national product, a term developed by U.S. government economists during the Depression, which included consumption as a proxy for prosperity: the more we consume, the better off we are, according to this model, which, in the postwar era, the U.S. assiduously spread abroad. The promise of endless growth also required an endless supply of oil to power factories, automobiles and jet planes. In 1945, President Franklin D. Roosevelt sealed a deal with Ibn Saud, the first King of Saudi Arabia, trading security for access to the country’s vast oil reserves. Every U.S. President since, implicitly or explicitly, has continued that exchange. The coronavirus pandemic is the most significant disruption yet to the postwar fossil-fuel order. The global economy is expected to contract more than 5% this year, according to the International Monetary Fund (IMF). This is a challenge so big that it has also created a once-in-a-lifetime opportunity to change direction. This moment comes just in time. In 2018, a landmark report from the Intergovernmental Panel on Climate Change, the U.N.’s climate-science body, warned that **allowing the planet to warm any more than 2°C above preindustrial levels would drive hundreds of millions of people into poverty,** destroy coral reefs and **leave some countries unable to adapt.** **A 2019 analysis in the journal Nature identified nine tipping points**–from the collapse of the West Antarctic ice sheet to the thawing of Arctic permafrost–that the planet appears close to reaching, any one of which might very well be triggered if warming exceeds 1.5°C. “**Going beyond 2°C is a very critical step**,” says Johan Rockstrom, director of the Potsdam Institute for Climate Impact Research, “not only in terms of economic and human impact but also **in terms of the stability of the earth**.” To keep temperatures from rising past the 1.5°C goal, we would need to cut global greenhouse-gas emissions 7.6% every year for the next decade, according to a report from the U.N. Environment Programme (UNEP). That’s about the level the COVID-19 pandemic will reduce emissions this year, but virtually no one thinks a deadly pandemic and accompanying unemployment is a sustainable way to halt climate change–and recessions are typically followed by sharp rebounds in emissions. To achieve the 1.5°C goal without creating mass disruption has always meant thoughtfully restructuring the global economy, moving it away from fossil-fuel extraction slowly but surely. Scientists and economists agree this is the last opportunity we have to do so. “If we delay further than 2020,” says Rockstrom, “there’s absolutely no empirical evidence that it can be done in an orderly way.” As of late June, countries had spent some $11 trillion on measures to halt the pandemic and stem its economic impact, according to the IMF. Economists say that’s not enough, and countries and central banks plan to keep doling out money to help the global economy stay afloat. There are lots of things we could be buying with that money that would make our lives better and protect us from climate disaster. In recent months, leading institutions across the spectrum have offered approaches that are varied in their specifics but generally similar in philosophy: invest in greener infrastructure. The International Energy Agency (IEA), for example, calls for an annual $1 trillion investment in clean energy for the next three years. At a cost of about 0.7% of global GDP, this would represent a small portion of the funds spent to combat COVID-19 but could be transformative. Expansion and modernization of electric grids would allow for easier flow of renewable energy. Governments could buy out gas-guzzling vehicles, pushing consumers to go electric. Homes and buildings could be retrofitted to consume less energy. This spending would also help solve the immediate problem of lost jobs and economic stagnation by creating nearly 10 million jobs worldwide and increasing global GDP by 1.1%, meaning it would add more to the economy than it costs. Importantly, green investment would result in a slew of “co-benefits.” For example, some rural communities would receive access to electricity for the first time. For another, air pollution would decline all over the world. “**If governments do not make use of this opportunity, they may miss a very important tool for the economic recovery**,” says Fatih Birol, head of the IEA. But this moment is not just about opportunity; even **maintaining the status quo is dangerous**. **Research from the UNEP released last year shows that if nations stick with current plans to reduce emissions, global temperatures will rise more than 3°C by the end of this century**. For the past five years, climate advocates had positioned 2020 as critical in the fight against climate change. Under the Paris Agreement, countries are required to submit new plans to reduce emissions in 2020, and climate diplomats had planned a series of meetings around the world this year to build momentum, culminating with the U.N. climate conference in Glasgow, in November. The Glasgow event was postponed a year, but the coronavirus pandemic has created a new sort of momentum. Empty city streets have been transformed into pedestrian space with cars banished, and many cities say they’re not going back. The oil industry has faced a reckoning, with the U.S. benchmark price at one point in mid-April dropping into negative territory and investors fleeing the industry; smaller firms filing for bankruptcy; and some of its biggest players writing down assets they say have lost their value. With the writing beginning to appear on the wall, many countries are starting to build a different world. In South Korea, the newly re-elected government has promised a $10 billion Green New Deal to invest in renewable energy and make public buildings energy efficient. In Costa Rica, one of a few developing countries to commit to eliminating their carbon footprint by 2050, leaders have created a new fee on gasoline to fund social-welfare programs and are planning to issue new green bonds to fund the next stage of climate adaptation programs. Rwanda, which has a GDP of roughly $9 billion, has adopted an $11 billion plan to reduce emissions and adapt to climate change, which includes a push for buses, cars and motorcycles to go electric. “We cannot afford to have the same mode of recovery, the same mode of doing business, the same mode of economic activity,” says Juliet Kabera, director general of the Rwanda Environment Management Authority. International institutions are playing a critical role nudging these countries. The IMF, which has said it “stands ready” to use its $1 trillion lending capacity to stave off the effects of the coronavirus pandemic, has made climate resilience a key criterion for its lending. This has already paid dividends: some 50 nations, including dozens of developing countries, committed in late June to address climate change in their coronavirus recovery plans. “It’s a great catalyst to think about building a new world,” says Costa Rican President Carlos Alvarado Quesada. “Whatever we decide as a country or as a global community in the next six or 10 or 12 months is going to determine what happens on the earth for the next decade.” Nowhere will such an approach have as large an impact as in the E.U. When compared with countries, the bloc is the world’s second largest economy and third largest emitter. Its pandemic recovery will help achieve the proposed target of halving its emissions in 10 years by spending $100 billion annually to make homes energy-efficient, $28 billion to build renewable energy capacity and up to $67 billion for zero-emissions trains. The European investment in going green will hurt coal-mining jobs in places like Poland and the Czech Republic, but the European recovery program will pay billions to retrain the workers and transition them to other industries. The measure awaits approval by the member countries, and the details are subject to negotiation, but observers do not expect the direction of the policy to change. **Other major players** in the global economy, most notably the U.S. and China, have not made as clear commitments to a green-tinged recovery. Upcoming decisions in both of those countries, which combined are responsible for nearly half of global emissions, are urgent. China is being pulled in two directions as it develops a plan that will set the course of its development–and, by extension, its emissions–for the next half decade. In March, as China’s coronavirus epidemic began to subside, the nation’s powerful Politburo Standing Committee, which is made up of senior leaders of the Communist Party, including President Xi Jinping, endorsed a proposal to expedite $1.4 trillion in spending on so-called “new infrastructure” that includes electric-vehicle charging stations and high-speed rail, as well as 5G technology, which wouldn’t cut emissions per se but would help advance the country’s tech sector rather than its heavy industry, stimulating economic growth with lower emissions.But the degree of commitment to those green recovery measures remains unclear. The Politburo Standing Committee’s push is unfunded, leaving provincial governments to follow through. So far, the evidence on the ground has not been encouraging. Local Chinese governments have approved new coal-fired power plants this year at the fastest clip since 2015–a surefire way to stimulate economic growth and emissions. And the country is reportedly planning to ramp up production of oil and natural gas. Demand has fallen, but cheaper oil and gas typically stimulate the economy. Abroad, China continues to fund emissions-intensive projects through its Belt and Road Initiative. In Africa, for instance, China is financing new coal-fired power plants, even as many international financial institutions have walked away from the energy source. External pressure is likely to force the issue, and the E.U. is trying to offer just that. To push China and others along, the bloc is crafting a new tax on imports from countries that aren’t reducing emissions. Climate and trade are both currently being discussed by officials behind the scenes and were planned to be on the top of the agenda at a now postponed September summit between the E.U. and China. “Europe is a very important market for the Chinese,” says Laurence Tubiana, the CEO of the European Climate Foundation and a key architect of the Paris Agreement. “China can be secured in its potential exports to Europe by understanding that it can secure positive trade relations by increasing its climate ambition.” Still, **when it comes to turning the climate ship around, there’s no substitute for the U.S**., **and the country has already missed opportunities**. For example, before doling out bailout money, France demanded that Air France stop operating emissions-intensive short routes, and Austria forced Austrian Airlines to agree to cut its emissions 30% by 2030. Contrast that with the U.S., where the government decreed that to receive federal dollars, airlines could not drop any of their destinations–even if that meant flying planes empty–and Congress rejected an attempt from several Democratic Senators to attach green strings to the airline bailout.It’s hard to imagine anything substantive so long as Trump is President. He and his GOP allies in Congress have an effective stranglehold on any policy that could push the U.S. to decarbonize, and thus far they have rejected big legislation to address climate change–portraying it as “socialist” and part of the Green New Deal that the progressive wing of the Democratic Party proposed last year to the derision of Republicans. Instead, the Trump Administration is reportedly preparing a $1 trillion infrastructure package focused on roads and bridges. “If we label it green, that would actually probably decrease its chances of being included,” said a Democratic congressional aide who works on energy and climate.So the future of U.S. emissions will likely fall to the winner in the fall. Joe Biden, the former Vice President and presumptive Democratic presidential nominee, is well aware of the role the pandemic recovery will play in shaping emissions. Biden oversaw the last U.S. stimulus a decade ago in the midst of the Great Recession. That package totaled nearly $800 billion, with $90 billion for clean-energy measures, and helped launch many of America’s green advances, including funding Tesla’s transformation from a boutique car company to the world’s most valuable auto manufacturer; funding a program that doubled the fuel efficiency of Daimler Trucks’ Freightliner model; and supporting the weatherization of more than a million homes to reduce residential energy consumption. That package created 900,000 jobs and turned a profit for the government, even as it suffered high-profile failures like the collapse of the Solyndra solar-panel company.Last year, Biden released a proposed Green New Deal, calling for $1.7 trillion in spending over 10 years on everything from electric vehicles to reducing pollution in low-income communities–all in service of the U.S.’s achieving net-zero emissions by the middle of the century. Since the coronavirus pandemic began, Biden has doubled down: he’s touted his Green New Deal and has appointed a committee that includes both longtime Washington climate advocates like former Secretary of State John Kerry and emerging leaders of the Democratic progressive wing like current New York Congresswoman Alexandria Ocasio-Cortez to craft new climate policy. Top congressional Democrats, signaling support for a big climate package, unveiled a 500-page legislative road map on June 30 that includes tax incentives and infrastructure spending to eliminate the country’s carbon footprint by 2050. It won’t become law this year, but it sends a signal that the issue will be on the legislative agenda if Biden wins in the fall.“We’ve got to strike now. We can’t let this go,” Biden said at a League of Conservation Voters virtual event on June 16. “Not because of me but because of the opportunity.” Importantly, Biden has promised to re-engage with the rest of the world on the issue, including by helping fund climate measures in developing countries. China wouldn’t be eligible to receive such funding, but the nation is keeping a close eye on how U.S. climate policy is unfolding. China has delayed several key decisions and signaled its intention to hold off making new climate commitments until after the U.S. presidential election. Even after three years of Trump’s tearing down the U.S.’s global reputation on climate, it turns out the U.S. is still leading the world. In what direction remains to be seen. To many who study climate, the pandemic looks eerily familiar. At first, the new virus seemed distant and inconsequential to most people, so long as you weren’t in the eye of the storm. The rest of the world watched in amazement as China shut down Wuhan. Horror stories of patients dying in hallways in Milan shocked the U.S., but not enough to make the nation prepare. In late February, at the last Democratic primary debate before voting in the critical state of South Carolina, moderators didn’t ask about the issue until one hour and 15 minutes into the discussion, and spent less than five minutes on it.Researchers estimate that by the time the U.S. collectively woke up to the stakes of the pandemic on March 11–the day Tom Hanks said he tested positive, the NBA canceled its season and Trump banned travelers from Europe–thousands of people had already been infected in the country. In the few months since, more than half a million people have died worldwide, including some 100,000 in the U.S., and there’s no sign we’ll be rid of the virus anytime soon. The story of climate change has unfolded over decades, but its trajectory is much the same. For years, we’ve watched as the evidence has grown. We’ve gaped as superstorms have battered the globe from Bangkok to Houston and unprecedented heat waves have popped up, killing a few thousand here and there. As I write this, it’s 100°F in Siberia, and wildfires are raging in an area infamous for its yearlong ice. “These are the warning signs” of cataclysmic climate change, says Gail Whiteman, a professor at Lancaster University who runs an Arctic research program.If Wuhan and Milan offered a preview of what the U.S. is now experiencing with COVID-19, where should the country look for a glimpse of a climate-changed world? Last year, I traveled to Fiji and found that for many of those living on the small Pacific Islands, on the front lines of brutal storms and sea-level rise, climate change is already the defining issue. If a storm destroys a school, students can’t learn. If the sugarcane crops are flooded, farmers lose their jobs. If sea levels rise too much, entire communities disappear. Climate concerns are at the center of their economies and the center of their development plans.“This can’t be the purview of even 25,000 or 40,000 or even 100,000 people,” says Christiana Figueres, who led the U.N. climate-change body during the Paris climate talks. “This has got to permeate through every single corner, every single channel, every single flow of economic development and modernization. It’s got to become the new norm.” That will come one way or another. Every country will be combatting climate change for the foreseeable future; the change in climate we’re experiencing today is in large part the result of emissions that happened more than a decade ago. However, we do have a choice of how bad it will get. If we invest in preserving nature and transitioning our energy system today, we will stave off the worst, giving us the ability to manage the hurricanes and floods as they come. If we wait, we’ll be stuck flat-footed when the worst arrives, watching in dismay as the temperature curve ticks up and up.

### Advantage – Space War

#### Inevitable market expansion guarantees wars over property rights—governments get quickly involved

Funnell 18 – Anthony, Writer for Future Tense News Citing Dean of Law at University of Adelaide, “War in space 'inevitable' because there's so much money to be made, expert warns”, ABC News, 8/23/2018, https://www.abc.net.au/news/2018-08-24/conflict-in-space-is-inevitable-expert-warns/10146314

A leading Australian space law expert has warned conflict over space assets is "inevitable", and more needs to be done now to avert the potential for hostility. Professor Melissa de Zwart, the Dean of Law at the University of Adelaide, says growing commercial interest in the mining of precious minerals on asteroids and planets has heightened the danger. "I think you have to be a realist about that," she said. "Where you have resources, where you have competition for those resources, where you have investment of money in the extraction of those resources ... there will be an expectation of security around that investment." While full-scale mining is yet to be tried, there is significant international interest. Japanese aerospace agency Jaxa has already successfully landed a robotic craft on an asteroid and taken samples. It currently has another probe hovering over an asteroid named Ryugu. Artist's impression of Hayabusa 2 PHOTO: Artist's impression of Jaxa's robotic craft flying above Ryugu. (Source: JAXA) Two American companies — Deep Space Industries and Planetary Resources — are thought to be the leaders in the field, but in May this year a UK firm called Asteroid Mining Corporation also entered the race. "Those corporations will be looking to the nation-state to say, well, are you going to protect our investment in this business?" Professor de Zwart said. A very crowded space The US Government and American firms continue to play a dominant role in more traditional space technology development and deployment. SpaceX, for example, is a major private supplier of rockets, while the US Air Force currently coordinates international satellite traffic, providing advanced warnings about potentially dangerous space debris. Listen to the episode Are we moving away from the notion that space is for all humankind? And is conflict in space inevitable? But the number of players is rapidly increasing. The OECD's Space Forum says more than 80 countries now have some form of space program, mostly concentrated on rockets, satellites and satellite-related services and technology. They estimate the global industry is worth somewhere around $US400 billion and growing quickly. And that figure could skyrocket if, and when, asteroid mining kicks off. Eric Stallmer, the president of the US-based Commercial Spaceflight Federation, a consortium of 85 space-related organisations and businesses, believes that moment is fast approaching. "I think we are looking at a five to 10-year timetable for developing that technology. It makes for an exciting time," he said

#### Asteroid mining furthers tensions between the US, China and Russia and escalates

Jamasmie 21 Cecilia Jamasmie [Cecilia has covered mining for more than a decade. She is particularly interested in Corporate Social Responsibility (CSR), Diamonds and Latin America. Cecilia has been interviewed by BBC News and CBC among others and has been a guest speaker at mining conventions, including MINExpo 2016 and the World’s Copper Conference 2018. She is also member of the expert panel on Social License to Operate (SLO) at the European project MIREU (Mining and Metallurgic Regions EU). She holds a Master of Journalism from the University of British Columbia, and is based in Nova Scotia.], 2-2-2021, "Experts warn of brewing space mining war among US, China and Russia," MINING, <https://www.mining.com/experts-warn-of-brewing-space-mining-war-among-us-china-and-russia/> DD AG

A brewing war to set a mining base in space is likely to see China and Russia joining forces to keep the US increasing attempts to dominate extra-terrestrial commerce at bay, experts warn. The Trump Administration took an active interest in space, announcing that America would return astronauts to the moon by 2024 and creating the Space Force as the newest branch of the US military.It also proposed global legal framework for mining on the moon, called the Artemis Accords, encouraging citizens to mine the Earth’s natural satellite and other celestial bodies with commercial purposes. The directive classified outer space as a “legally and physically unique domain of human activity” instead of a “global commons,” paving the way for mining the moon without any sort of international treaty. Spearheaded by the US National Aeronautics and Space Administration (NASA), the Artemis Accords were signed in October by Australia, Canada, England, Japan, Luxembourg, Italy and the United Emirates “Unfortunately, the Trump Administration exacerbated a national security threat and risked the economic opportunity it hoped to secure in outer space by failing to engage Russia or China as potential partners,” says Elya Taichman, former legislative director for then-Republican Michelle Lujan Grisham. “Instead, the Artemis Accords have driven China and Russia toward increased cooperation in space out of fear and necessity,” he writes.Russia’s space agency Roscosmos was the first to speak up, likening the policy to colonialism. “There have already been examples in history when one country decided to start seizing territories in its interest — everyone remembers what came of it,” Roscosmos’ deputy general director for international cooperation, Sergey Saveliev, said at the time.China, which made history in 2019 by becoming the first country to land a probe on the far side of the Moon, chose a different approach. Since the Artemis Accords were first announced, Beijing has approached Russia to jointly build a lunar research base. President Xi Jinping has also he made sure China planted its flag on the Moon, which happened in December 2020, more than 50 years after the US reached the lunar surface.

#### Space wars go nuclear

Grego 18 – Laura, Senior Scientist in the Global Security Program at the Union of Concerned Scientists, Postdoctoral Researcher at the Harvard-Smithsonian Center for Astrophysics, PhD in Experimental Physics at the California Institute of Technology, Space and Crisis Stability, Union of Concerned Scientists, 3-19-18, <https://www.law.upenn.edu/live/files/7804-grego-space-and-crisis-stabilitypdf>

Why space is a particular problem for crisis stability For a number of reasons, space poses particular challenges in preventing a crisis from starting or from being managed well. Some of these are to do with the physical nature of space, such as the short timelines and difficulty of attribution inherent in space operations. Some are due to the way space is used, such as the entanglement of strategic and tactical missions and the prevalence of dual-use technologies. Some are due to the history of space, such the absence of a shared understanding of appropriate behaviors and consequences, and a dearth of stabilizing personal and institutional relationships. While some of these have terrestrial equivalents, taken together, they present a special challenge. The vulnerability of satellites and first strike incentives Satellites are inherently fragile and difficult to protect; in the language of strategic planners, space is an “offense-dominant” regime. This can lead to a number of pressures to strike first that don‘t exist for other, better-protected domains. Satellites travel on predictable orbits, and many pass repeatedly over all of the earth‘s nations. Low-earth orbiting satellites are reachable by missiles much less capable than those needed to launch satellites into orbit, as well as by directed energy which can interfere with sensors or with communications channels. Because launch mass is at a premium, satellite armor is impractical. Maneuvers on orbit need costly amounts of fuel, which has to be brought along on launch, limiting satellites‘ ability to move away from threats. And so, these very valuable satellites are also inherently vulnerable and may present as attractive targets. Thus, an actor with substantial dependence on space has an incentive to strike first if hostilities look probable, to ensure these valuable assets are not lost. Even if both (or all) sides in a conflict prefer not to engage in war, this weakness may provide an incentive to approach it closely anyway. A RAND Corporation monograph commissioned by the Air Force15 described the issue this way: First-strike stability is a concept that Glenn Kent and David Thaler developed in 1989 to examine the structural dynamics of mutual deterrence between two or more nuclear states.16 It is similar to crisis stability, which Charles Glaser described as ―a measure of the countries‘ incentives not to preempt in a crisis, that is, not to attack first in order to beat the attack of the enemy,‖17 except that it does not delve into the psychological factors present in specific crises. Rather, first strike stability focuses on each side‘s force posture and the balance of capabilities and vulnerabilities that could make a crisis unstable should a confrontation occur. For example, in the case of the United States, the fact that conventional weapons are so heavily dependent on vulnerable satellites may create incentives for the US to strike first terrestrially in the lead up to a confrontation, before its space-derived advantages are eroded by anti-satellite attacks.18 Indeed, any actor for which satellites or space-based weapons are an important part of its military posture, whether for support missions or on-orbit weapons, will feel “use it or lose it” pressure because of the inherent vulnerability of satellites. Short timelines and difficulty of attribution The compressed timelines characteristic of crises combine with these “use it or lose it” pressures to shrink timelines. This dynamic couples dangerously with the inherent difficulty of determining the causes of satellite degradation, whether malicious or from natural causes, in a timely way. Space is a difficult environment in which to operate. Satellites orbit amidst increasing amounts of debris. A collision with a debris object the size of a marble could be catastrophic for a satellite, but objects of that size cannot be reliably tracked. So a failure due to a collision with a small piece of untracked debris may be left open to other interpretations. Satellite electronics are also subject to high levels of damaging radiation. Because of their remoteness, satellites as a rule cannot be repaired or maintained. While on-board diagnostics and space surveillance can help the user understand what went wrong, it is difficult to have a complete picture on short timescales. Satellite failure on-orbit is a regular occurrence19 (indeed, many satellites are kept in service long past their intended lifetimes). In the past, when fewer actors had access to satellite-disrupting technologies, satellite failures were usually ascribed to “natural” causes. But increasingly, even during times of peace operators may assume malicious intent. More to the point, in a crisis when the costs of inaction may be perceived to be costly, there is an incentive to choose the worst-case interpretation of events even if the information is incomplete or inconclusive. Entanglement of strategic and tactical missions During the Cold War, nuclear and conventional arms were well separated, and escalation pathways were relatively clear. While space-based assets performed critical strategic missions, including early warning of ballistic missile launch and secure communications in a crisis, there was a relatively clear sense that these targets were off limits, as attacks could undermine nuclear deterrence. In the Strategic Arms Limitation Treaty, the US and Soviet Union pledged not to interfere with each other‘s ―national technical means‖ of verifying compliance with the agreement, yet another recognition that attacking strategically important satellites could be destabilizing.20 There was also restraint in building the hardware that could hold these assets at risk. However, where the lines between strategic satellite missions and other missions are blurred, these norms can be weakened. For example, the satellites that provide early warning of ballistic missile launch are associated with nuclear deterrent posture, but also are critical sensors for missile defenses. Strategic surveillance and missile warning satellites also support efforts to locate and destroy mobile conventional missile launchers. Interfering with an early warning sensor satellite might be intended to dissuade an adversary from using nuclear weapons first by degrading their missile defenses and thus hindering their first-strike posture. However, for a state that uses early warning satellites to enable a “hair trigger” or launch-on-attack posture, the interference with such a satellite might instead be interpreted as a precursor to a nuclear attack. It may accelerate the use of nuclear weapons rather than inhibit it. Misperception and dual-use technologies Some space technologies and activities can be used both for relatively benign purposes but also for hostile ones. It may be difficult for an actor to understand the intent behind the development, testing, use, and stockpiling of these technologies, and see threats where there are none. (Or miss a threat until it is too late.) This may start a cycle of action and reaction based on misperception. For example, relatively low-mass satellites can now maneuver autonomously and closely approach other satellites without their cooperation; this may be for peaceful purposes such as satellite maintenance or the building of complex space structures, or for more controversial reasons such as intelligence-gathering or anti-satellite attacks. Ground-based lasers can be used to dazzle the sensors of an adversary‘s remote sensing satellites, and with sufficient power, they may damage those sensors. The power needed to dazzle a satellite is low, achievable with commercially available lasers coupled to a mirror which can track the satellite. Laser ranging networks use low-powered lasers to track satellites and to monitor precisely the Earth‘s shape and gravitational field, and use similar technologies. 21 Higher-powered lasers coupled with satellite-tracking optics have fewer legitimate uses. Because midcourse missile defense systems are intended to destroy long-range ballistic missile warheads, which travel at speeds and altitudes comparable to those of satellites, such defense systems also have inherent ASAT capabilities. In fact, while the technologies being developed for long-range missile defenses might not prove very effective against ballistic missiles—for example, because of the countermeasure problems associated with midcourse missile defense— they could be far more effective against satellites. This capacity is not just theoretical. In 2007, China demonstrated a direct-ascent anti-satellite capability which could be used both in an ASAT and missile defense role, and in 2009, the United States used a ship-based missile defense interceptor to destroy a satellite, as well. US plans indicated a projected inventory of missile defense interceptors with capability to reach all low earth orbiting satellites in the dozens in the 2020s, and in the hundreds by 2030.22 Discrimination The consequences of interfering with a satellite may be vastly different depending on who is affected and how, and whether the satellite represents a legitimate military objective. However, it will not always be clear who the owners and operators of a satellite are, and users of a satellite‘s services may be numerous and not public. Registration of satellites is incomplete23 and current ownership is not necessarily updated in a readily available repository. The identification of a satellite as military or civilian may be deliberately obscured. Or its value as a military asset may change over time; for example, the share of capacity of a commercial satellite used by military customers may wax and wane. A potential adversary‘s satellite may have different or additional missions that are more vital to that adversary than an outsider may perceive. An ASAT attack that creates persistent debris could result in significant collateral damage to a wide range of other actors; unlike terrestrial attacks, these consequences are not limited geographically, and could harm other users unpredictably. In 2015, the Pentagon‘s annual wargame**,** or simulated conflict, involving space assets focused on a future regional conflict. The official report out24warnedthatit was hard to keep the conflict contained geographically when using anti-satellite weapons: As the wargame unfolded, a regional crisis quickly escalated, partly because of the interconnectedness of a multi-domain fight involving a capable adversary. The wargame participants emphasized the challenges in containing horizontal escalation once space control capabilities are employedto achieve limited national objectives. Lack of shared understanding of consequences/proportionalityStates havefairly similar understandings of the implications of military actions on the ground, in the air, and at sea,built over decades of experience. The United States and the Soviet Union/Russia have built some shared understanding of each other‘s strategic thinking on nuclear weapons, though this is less true for other states with nuclear weapons. But in the context of nuclear weapons, there is an arguable understanding about the crisis escalation based on the type of weapon (strategic or tactical) and the target (counterforce—against other nuclear targets, or countervalue—against civilian targets). Because of a lack of experience in hostilities that target space-based capabilities, it is not entirely clear what the proper response to a space activity is and where the escalation thresholds or “red lines” lie. Exacerbating this is the asymmetry in space investments; not all actors will assign the same value to a given target or same escalatory nature to different weapons.

#### Nuclear war causes extinction.

Starr ’17 (Steven; director of the University of Missouri’s Clinical Laboratory Science Program, senior scientist at the Physicians for Social Responsibility, Associate member of the Nuclear Age Peace Foundation, expert in the environmental consequences of nuclear war; 1/9/17; “Turning a Blind Eye Towards Armageddon — U.S. Leaders Reject Nuclear Winter Studies”; <https://fas.org/2017/01/turning-a-blind-eye-towards-armageddon-u-s-leaders-reject-nuclear-winter-studies/>; Federation of American Scientists; accessed 11/24/18; TV) [AV]

The detonation of an atomic bomb with this explosive power will **instantly ignite fires** over a surface area of three to five square miles. In the recent studies, the scientists calculated that the **blast**, **fire**, and **radiation** from a war fought with 100 atomic bombs could produce **direct fatalities** comparable to all of those worldwide in World War II, or to those once estimated for a “**counterforce**” **nuclear war** between the superpowers. However, the **long-term environmental effects** of the war **could** significantly disrupt the global weather for at least a decade, which would likely **result in** a vast **global famine**. The scientists predicted that **nuclear firestorms** in the burning cities would cause at least five million tons of **black carbon smoke** to quickly rise above cloud level into the stratosphere, where it could not be rained out. The smoke would circle the Earth in **less than two weeks** and would form **a** global **stratospheric smoke layer** that **would remain for** more than **a decade**. The smoke would absorb warming sunlight, which would **heat the smoke** to temperatures near the boiling point of water, producing **ozone losses of** 20 to **50 percent** over populated areas. This would almost double the amount of UV-B reaching the most populated regions of the mid-latitudes, and it would create UV-B indices unprecedented in human history. In North America and Central Europe, the time required to get a painful sunburn at mid-day in June could decrease to as little as six minutes for fair-skinned individuals. As the smoke layer blocked warming sunlight from reaching the Earth’s surface, it would produce the **coldest** average **surface temperatures** in the last 1,000 years. The scientists calculated that global **food production would decrease** by 20 to **40 percent** during a five-year period following such a war. Medical experts have predicted that the shortening of growing seasons and corresponding decreases in agricultural production could cause up to **two billion** people to perish from **famine**. The climatologists also investigated the effects of a nuclear war fought with the vastly more powerful modern **thermonuclear** weapons possessed by the United States, Russia, China, France, and England. Some of the thermonuclear weapons constructed during the 1950s and 1960s were 1,000 times more powerful than an atomic bomb. During the last 30 years, the average size of thermonuclear or “strategic” nuclear weapons has decreased. Yet today, each of the approximately 3,540 strategic weapons deployed by the United States and Russia is seven to **80 times** more powerful than the atomic bombs modeled in the India-Pakistan study. The smallest strategic nuclear weapon has an explosive power of **100,000 tons of TNT**, compared to an atomic bomb with an average explosive power of 15,000 tons of TNT. Strategic nuclear weapons produce much larger nuclear firestorms than do atomic bombs. For example, a standard Russian 800-kiloton warhead, on an average day, will ignite fires covering a surface area of 90 to 152 square miles. A **war** fought with hundreds or thousands of U.S. and Russian strategic nuclear weapons would **ignite immense** **nuclear firestorms** covering land surface areas of many thousands or **tens of thousands** of square miles. The scientists calculated that these fires would produce up to **180 million tons** of black carbon soot and **smoke**, which would form a dense, **global stratospheric smoke layer**. The smoke would remain in the stratosphere for 10 to **20 years**, and it **would block** as much as **70 percent of sunlight** from reaching the surface of the Northern Hemisphere and 35 percent from the Southern Hemisphere. So much sunlight would be blocked by the smoke that the noonday sun would resemble a full moon at midnight. Under such conditions, it would only require a matter of days or weeks for daily minimum **temperatures** to **fall below freezing** in the largest agricultural areas of the Northern Hemisphere, where freezing temperatures would occur every day for a period of between one to more than two years. Average surface temperatures would become colder than those experienced 18,000 years ago at the height of the last Ice Age, and the prolonged cold would cause average rainfall to decrease by up to 90%. Growing seasons would be completely eliminated for more than a decade; it would be **too cold and dark** to grow food crops, **which would doom the** majority of the **human population.** NUCLEAR WINTER IN BRIEF The profound cold and darkness following nuclear war became known as nuclear winter and was first predicted in 1983 by a group of NASA scientists led by Carl Sagan. During the mid-1980s, a large body of research was done by such groups as the Scientific Committee on Problems of the Environment (SCOPE), the World Meteorological Organization, and the U.S. National Research Council of the U.S. National Academy of Sciences; their work essentially supported the initial findings of the 1983 studies. The idea of nuclear winter, published and supported by prominent scientists, generated extensive public alarm and put political pressure on the United States and Soviet Union to reverse a runaway nuclear arms race, which, by 1986, had created a global nuclear arsenal of more than 65,000 nuclear weapons. Unfortunately, this created a backlash among many powerful military and industrial interests, who undertook an extensive media campaign to brand nuclear winter as “bad science” and the scientists who discovered it as “irresponsible.” Critics used various uncertainties in the studies and the first climate models (which are primitive by today’s standards) as a basis to criticize and reject the concept of nuclear winter. In 1986, the Council on Foreign Relations published an article by scientists from the National Center for Atmospheric Research, who predicted drops in global cooling about half as large as those first predicted by the 1983 studies and described this as a “nuclear autumn.”